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ABSTRACT:

PROBLEM TO BE SOLVED: To make control of frosting on a front fringe part of a fin compatible with attainment of high fin efficiency in a non-frosting state.

SOLUTION: This heat exchanger has a heat transfer pipe 3 disposed biasedly to a rear fringe 2Ab of a fin 2A. Further, a first plane part 11 passing a center of the heat transfer pipe 3 and extending in a widthwise direction of the fin and a plurality of cut-and-erected parts 4, 4... located on both sides of a lengthwise direction of the fin with regard to the first plane part 11 and extending in the lengthwise direction of the fin are provided in a position more biases to a front fringe 2Aa than the heat transfer pipe 3.

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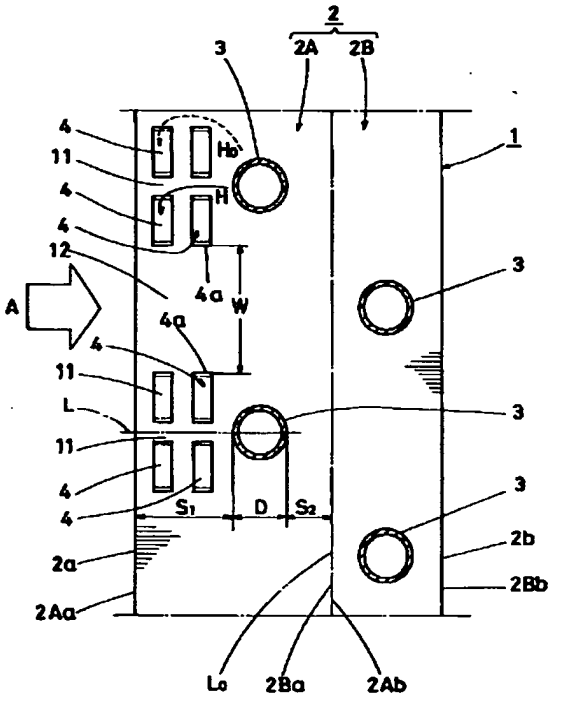
(54)【発明の名称】　熱交換器

(57)【要約】　（修正有）

【課題】　熱交換器において、フィン前縁部分の着霜抑制と非着霜状態における高いフィン効率の確保とを両立させる。

【解決手段】　フィン２Ａの後縁２Ａｂ寄りに偏心させて伝熱管３を配置するとともに、該伝熱管３よりも前縁２Ａａ寄り部位に、該伝熱管３の中心を通ってフィン幅方向に延びる第１平坦部１１と該第１平坦部１１に対してフィン長さ方向の両側にそれぞれ位置し且つ該フィン長さ方向に延びる複数の切起し４，４，・・とを設ける。



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【特許請求の範囲】

【請求項1】　伝熱管（3）に対してこれに直交する方向にフィン（2A）を取り付け、該フィン（2A）の幅方向の一端に位置する前縁（2Aa）側から他端に位置する後縁（2Ab）側に向けて冷却風を流通させるようにした熱交換器であって、

上記伝熱管（3）が、上記フィン（2A）の幅方向における中心位置よりも上記後縁（2Ab）寄りに偏心して配置されているとともに、

上記フィン（2A）における上記伝熱管（3）よりも上記前縁（2Aa）寄り部位には、該伝熱管（3）の中心を通ってフィン幅方向に延びる直線（L）に対応して該フィン幅方向に延びる所定幅の平坦面で構成される第1平坦部（11）と、該第1平坦部（11）に対してフィン長さ方向の両側にそれぞれ位置し且つ該フィン長さ方向に延びる複数の切起し（4），（4），・・とが設けられていることを特徴とする熱交換器。

【請求項2】　請求項1において、

フィン長さ方向において隣接する一方の伝熱管（3）側における上記切起し（4）のフィン長さ方向端部（4a）と他方の伝熱管（3）側における上記切起し（4）のフィン長さ方向端部（4a）との間に、フィン幅方向に延びる平坦面で構成される第2平坦部（12）が設けられるとともに、該第2平坦部（12）のフィン長さ方向における寸法（W）が、上記伝熱管（3）の外径を（D）としたとき、「W≧D／2」となるように設定されていることを特徴とする熱交換器。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本願発明は、クロスフィン型の熱交換器に関するものである。

【0002】

【従来の技術】従来より、空気調和機用の熱交換器として、伝熱管に対してこれに直交する方向に向けて複数枚のフィンを取り付けて該フィンの前縁側から後縁側に向けて冷却風を流通させることで該冷却風と上記伝熱管内を流通する冷媒との間において熱交換を行わしめるようにした所謂クロスフィンタイプの熱交換器が広く使用されている。

【0003】ところで、かかる熱交換器が室外機用熱交換器として使用された場合、冬季の暖房運転時においては、外気温度が0℃以下に下がると、フィン表面に着霜を生じ、通風抵抗の増加により風量が低下して暖房能力が低下するという問題があった。そして、かかるフィンへの着霜に起因する問題を解決するためのひとつの有効な手段として、例えば実開昭61－161569号公報にも開示されるように、フィンに対して伝熱管をフィン幅方向の中心位置よりも後縁側に偏心させて配置し、フィン前縁側のフィン効率を意識的に低下させて着霜を抑制する技術が知られている。尚、このように伝熱管をフィン後縁側に偏心配置するのは、フィン前縁部分は前縁効果により高い伝熱効率が得られる反面、着霜が最も生じ易い部位であることから、伝熱管をフィン前縁から遠ざけることで該前縁部分のフィン効率を低下させるためである。

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【0004】

【発明が解決しようとする課題】ところが、このように着霜抑制の観点からフィンの前縁部分のフィン効率を低下させるようにした場合には、着霜が生じていない状態では上記フィン前縁部分のフィン効率の低下分だけ熱交換器の熱交換能力が低下することになる。また、フィン前縁部分のフィン効率を低下させた結果、該前縁部分に着霜が生じた場合の除霜時にはその除霜効率が低下し除霜運転時間が長くなるという問題もあった。

【0005】そこで本願発明は、フィン前縁部分の着霜の抑制と非着霜状態における高いフィン効率の確保とを両立させるとともに、着霜が生じた状態における風量の確保と除霜効率の向上とを図り得るようにした熱交換器を提供することを目的としてなされたものである。

【0006】

【課題を解決するための手段】本願発明ではかかる課題を解決するための具体的手段として次のような構成を採用している。

【0007】本願の第1の発明では、伝熱管3に対してこれに直交する方向にフィン2Aを取り付け、該フィン2Aの幅方向の一端に位置する前縁2Aa側から他端に位置する後縁2Ab側に向けて冷却風を流通させるようにした熱交換器において、上記伝熱管3を、上記フィン2Aの幅方向における中心位置よりも上記後縁2Ab寄りに偏心して配置するとともに、上記フィン2Aにおける上記伝熱管3よりも上記前縁2Aa寄り部位に、該伝熱管3の中心を通ってフィン幅方向に延びる直線Lに対応して該フィン幅方向に延びる所定幅の平坦面で構成される第1平坦部11と、該第1平坦部11に対してフィン長さ方向の両側にそれぞれ位置し且つ該フィン長さ方向に延びる複数の切起し4，4，・・とを設けたことを特徴としている。

【0008】本願の第2の発明では、上記第1の発明にかかる熱交換器において、フィン長さ方向において隣接する一方の伝熱管3側における上記切起し4のフィン長さ方向端部4aと他方の伝熱管3側における上記切起し4のフィン長さ方向端部4aとの間に、フィン幅方向に延びる平坦面で構成される第2平坦部12を設けるとともに、該第2平坦部12のフィン長さ方向における寸法Wを、上記伝熱管3の外径をDとしたとき、「W≧D／2」となるように設定したことを特徴としている。

【0009】

【発明の効果】本願発明ではかかる構成とすることにより次のような効果が得られる。

【0010】①　本願の第1の発明にかかる熱交換器

は、上記伝熱管3を、上記フィン2Aの幅方向における中心位置よりも上記後縁2Ab寄りに偏心して配置するとともに、上記フィン2Aにおける上記伝熱管3よりも上記前縁2Aa寄り部位に、該伝熱管3の中心を通ってフィン幅方向に延びる直線Lに対応して該フィン幅方向に延びる所定幅の平坦面で構成される第1平坦部11と、該第1平坦部11に対してフィン長さ方向の両側にそれぞれ位置し且つ該フィン長さ方向に延びる複数の切起し4，4，・・とを設けている。

【0011】従って、上記伝熱管3が上記フィン2Aのフィン幅方向の中央よりも後縁2Ab寄りに偏心配置されていることで、該伝熱管3がフィン幅方向の中央部に配置されている場合に比して、該後縁2Ab部分のフィン効率が低く、それだけ該前縁2Aa部分への着霜が抑制されることになる。

【0012】一方、上記伝熱管3を上記フィン2Aの後縁2Ab寄りに偏心配置したことによる前縁2Aa部分のフィン効率の低下が、上記伝熱管3よりも前縁2Aa寄り部分に上記切起し4，4，・・を設けて表面熱伝達率を向上させることでフィン2A全体として高い伝熱性能が確保され、非着霜状態における熱交換能力が良好に維持されることになる。

【0013】さらに、上記切起し4，4，・・を設けたことで、暖房運転時には該切起し4，4，・・部分に着霜を生じ易くなり、該切起し4，4，・・に生じた着霜の除去が必要となる。この場合、該切起し4，4，・・の除霜は上記伝熱管3側から該切起し4，4，・・への熱伝達によって行われるが、この場合、該切起し4，4，・・が上記第1平坦部11に対してその両側に位置するように配置されているので、該第1平坦部11を介して上記切起し4，4，・・に至る伝熱経路の経路長は、例えば該第1平坦部11が設けられておらず上記切起し4，4，・・がフィン長さ方向に連続している場合のように上記伝熱管3から上記切起し4，4，・・の外端部側に迂回して伝熱される場合に比して可及的に短くなり、従って、上記伝熱管3から上記各切起し4，4，・・により効率良く熱が伝達され、上記各切起し4，4，・・の着霜がより迅速に除去され、それだけ除霜時間の短縮が図れるものである。

【0014】② 本願の第2の発明にかかる熱交換器によれば、上記①に記載の効果に加えて次のような特有の効果が奏せられる。即ち、この発明では、フィン長さ方向において隣接する一方の伝熱管3側における上記切起し4のフィン長さ方向端部4aと他方の伝熱管3側における上記切起し4のフィン長さ方向端部4aとの間に、フィン幅方向に延びる平坦面で構成される第2平坦部12を設けるとともに、該第2平坦部12のフィン長さ方向における寸法Wを、上記伝熱管3の外径をDとしたとき、「W≧D／2」となるように設定している。

【0015】従って、上記フィン2Aの上記切起し4，

4，・・部分に着霜を生じると、理論上はその着霜分だけ冷却風の通路面積が減少し通風抵抗が大きくなるが、この発明では上記切起し4，4，・・が上記伝熱管3よりも前縁2Aa寄り部位、即ち、元々通風量が少ない部位に設けられており、該切起し4，4，・・に着霜を生じてもこれによる通風量の減少は少ないことに加えて、フィン長さ方向に隣接する一方の伝熱管3側の切起し4，4，・・と他方の伝熱管3側の切起し4，4，・・との間、即ち、最も通風抵抗が低く通風量が多い部位に、上記伝熱管3の外径をDとしたときその幅寸法Wが「W≧D／2」となるように設定された通風抵抗の小さい上記第2平坦部12が設けられることで該部位における通風量が確保されており、これらの相乗効果として、上記切起し4，4，・・への着霜に拘わらず十分な通風量が確保されるものである。

【0016】

【発明の実施の形態】以下、本願発明にかかる熱交換器を好適な実施形態に基づいて具体的に説明する。図1には、本願発明の実施形態にかかる熱交換器1を示している。この熱交換器1は、平坦な薄帯板で構成されるフィン2と該フィン2をその板厚方向に貫通して且つ前後二列に配置された複数本の伝熱管3，3，・・とを備えて構成されている。尚、この実施形態のものにおいては、上記フィン2を、その前縁2a寄りに位置する一列目の各伝熱管3，3，・・に対応するフィン2Aと後縁2b寄りに位置する二列目の各伝熱管3，3，・・に対応するフィン2Bとを一体化した形態としているが、実質的には同図の鎖線L_0を境として前縁2a側のフィン2Aと後縁2b側のフィン2Bとに区別されるものである。そして、この実施形態のものにおいては、上記フィン2A側の構造に本願発明を適用したものである。従って、以下においては、主として、上記フィン2A側の構造等について説明する。

【0017】上記フィン2A側においては、該フィン2Aのフィン幅方向の中央よりも後縁2Ab寄り位置に偏心させて、一列目管列を構成する上記各伝熱管3，3，・・を配置している（即ち、伝熱管3と前縁2Aaとの間隔を「S_1」、伝熱管3と後縁2Abとの間隔を「S_2」としたとき、「$S_1 > S_2$」）。そして、上記フィン2Aにおける上記伝熱管3よりも前縁2Aa寄り部位には、次述する第1平坦部11と複数の切起し4，4，・・とが形成されている。

【0018】上記切起し4，4，・・は、上記フィン2Aの一部をフィン長さ方向方向に延びる短冊状に切り起こしてなるものであって、上記伝熱管3の中心を通ってフィン幅方向に延びる直線Lをフィン長さ方向に挟んで両側にそれぞれ二列に配置されている。そして、上記直線Lの一方側に位置する切起し4，4と他方側に位置する切起し4，4との間は、上記伝熱管3からフィン幅方向に上記前縁2Aaまで延び平坦面でなる第1平坦部1

１とされている。即ち、上記第１平坦部１１をフィン長さ方向に挟んだ両側に上記切起し４，４，・・がそれぞれ配置されている。

【００１９】また、フィン長さ方向において隣接する一方の伝熱管３と他方の伝熱管３との関係においては、該一方の伝熱管３側に対応する上記切起し４，４，・・の外端部４ａと他方の伝熱管３側に対応する上記切起し４，４，・・の外端部４ａとを、フィン長さ方向において所定寸法Ｗをもって離間させている。従って、この一方の伝熱管３に対応する切起し４，４，・・と他方の伝熱管３に対応する切起し４，４，・・との間には、所定幅寸法をもち且つ上記フィン２Ａの前縁２Ａａから後縁２Ａｂに跨がって延びる平坦面でなる第２平坦部１２が形成される。尚、上記第２平坦部１２の幅寸法Ｗは、上記伝熱管３の外径を「Ｄ」としたとき、「Ｗ≧Ｄ／２」となるように適宜設定される。

【００２０】一方、上記フィン２の後縁２ｂ寄りに位置する上記フィン２Ｂ側においては、二列目管群を構成する複数の伝熱管３，３，・・が、フィン幅方向の略中央（即ち、その前縁２Ｂａと後縁２Ｂｂとの略中央）に位置するようにして取り付けられている。尚、この場合、フィン幅方向（即ち、冷却風Ａの流通方向）において、一列目の各伝熱管３，３，・・の管間位置のそれぞれに二列目の各伝熱管３，３，・・のそれぞれが位置するように一列目の各伝熱管３，３，・・と二列目の各伝熱管３，３，・・の配置位置が相対的に設定されている。

【００２１】かかる構成とされた熱交換器１においては、次のような特有の作用効果が奏せられる。

【００２２】先ず、上記各伝熱管３，３，・・が上記フィン２Ａのフィン幅方向の中央よりも後縁２Ａｂ寄りに偏心配置されているので該各伝熱管３，３，・・から上記前縁２Ａａまでの距離が長くなり、例えば各伝熱管３，３，・・がフィン幅方向の中央部に配置されている場合に比して、該後縁２Ａｂ部分のフィン効率が低くなっている。従って、フィン効率が低下した分だけ上記前縁２Ａａ部分への着霜が抑制されることになる。

【００２３】一方、このように上記各伝熱管３，３，・・をフィン２Ａの後縁２Ａｂ側に偏心配置して前縁２Ａａ部分のフィン効率を下げた構成とすると、該前縁２Ａａ部分への着霜は抑制できる反面、該前縁２Ａａに着霜が生じていない状態においては上記フィン効率の低下分だけ熱交換器１全体としての熱交換能力が低下するという問題が生じることは既述の通りである。ところが、この実施形態のものにおいては、上記各伝熱管３，３，・・よりも前縁２Ａａ寄り部分に、高い表面熱伝達率が得られる上記切起し４，４，・・を設けているので、上記各伝熱管３，３，・・を上記フィン２Ａの後縁２Ａｂ寄りに偏心配置したことによる上記フィン２Ａの前縁２Ａａ部分におけるフィン効率の低下が上記各切起し４，４，・・の表面熱伝達率によって補填され、フィン２Ａ全体としての伝熱性能は、例えば各伝熱管３，３，・・をフィン２Ａのフィン幅方向の中央部に配置した構成の場合におけると同等程度あるいはそれ以上の伝熱性能が確保され、上記各伝熱管３，３，・・の偏心配置にも拘わらず高い熱交換能力が得られることになる。

【００２４】さらに、上述のように、上記フィン２Ａの上記伝熱管３よりも前縁２Ａａ寄り部位に上記切起し４，４，・・を設けたことで、暖房運転時には該切起し４，４，・・部分に着霜を生じ易くなり、着霜が生じた場合の除霜対象部位は主として上記切起し４，４，・・部分となる。そして、該切起し４，４，・・に生じた着霜の除霜は、上記伝熱管３側から該切起し４，４，・・側への熱伝達によって行われる。この場合、この実施形態のものにおいては、上記切起し４，４，・・が上記第１平坦部１１に対してその両側に位置するように配置されているので、図１に実線矢印Ｈで示すように、該第１平坦部１１が上記伝熱管３から上記切起し４，４，・・への伝熱経路となり、特に最も前縁２Ａａ寄りに位置する切起し４側への伝熱経路長さは、例えば該第１平坦部１１が設けられておらず上記切起し４，４，・・がフィン長さ方向に連続している場合のように、上記伝熱管３からの熱が図１に破線矢印H_0で示すように上記切起し４，４，・・の外端部側へ迂回した伝熱経路を介して伝熱される構成のものに比して、可及的に短くなる。この結果、除霜運転時には、上記伝熱管３から上記各切起し４，４，・・へ効率良く熱が伝達され、該各切起し４，４，・・部分における除霜がより迅速に行われ、除霜時間の短縮化による暖房特性の向上が期待できることになる。

【００２５】また、上記フィン２Ａの上記切起し４，４，・・部分に着霜を生じると、理論上はその着霜分だけ冷却風の通路面積が減少し通風抵抗が大きくなるが、この発明では上記切起し４，４，・・が上記伝熱管３よりも前縁２Ａａ寄り部位、即ち、元々通風量が少ない部位に設けられており該切起し４，４，・・に着霜を生じてもこれによる通風量の減少は少ないこと、及びフィン長さ方向において隣接する一方の伝熱管３側における上記切起し４のフィン長さ方向端部４ａと他方の伝熱管３側における上記切起し４のフィン長さ方向端部４ａとの間に、上記伝熱管３の外径をＤとしたときフィン長さ方向における幅寸法Ｗが「Ｗ≧Ｄ／２」となるように設定された上記第２平坦部１２が形成され、最も通風量の多い伝熱管の中間部位の通風抵抗が低く抑えられ十分な通風量が確保されること、の相乗効果として、上記切起し４，４，・・への着霜に拘わらず熱交換器１全体として十分な通風量が確保されることになる。

【００２６】その他

（１）　上記実施形態においては、二列の伝熱管群を備えた熱交換器１を例にとって説明しているが、本願発明はかかる構成のものに限定されるものではなく、例えば

伝熱管群が一列のもの、あるいは三列以上のものにも適用できることは勿論である。

【００２７】（２）　上記実施形態においては、上記フィン２としてプレートフィンを採用したものを例にとって説明しているが、他の実施形態においては該フィン２としてワッフルフィンを採用することもできるものである。

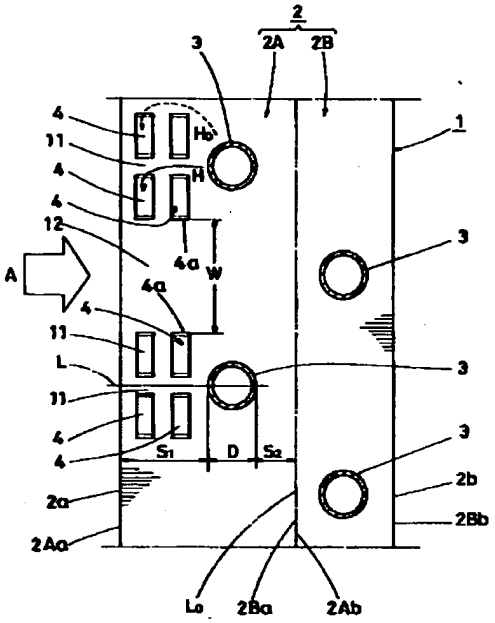
【図面の簡単な説明】

【図１】本願発明の実施形態にかかる熱交換器の断面図である。

【符号の説明】

１は熱交換器、２はフィン、３は伝熱管、４は切起し、１１は第１平坦部、１２は第２平坦部である。

【図１】



1.This document has been translated by computer. So the translation may not reflect the original precisely.
2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] The invention in this application relates to the heat exchanger of a cross fin mold.
[0002]
[Description of the Prior Art] The so-called cross fin type it was made to make heat exchange perform between these refrigerants that circulate the inside of the above-mentioned heat exchanger tube as the style of cooling by attaching the fin of two or more sheets conventionally towards the direction which intersects perpendicularly with receiving a heat exchanger tube as a heat exchanger for air conditioners, and circulating a cooling wind towards a trailing-edge side from the first transition side of this fin of heat exchanger is used widely.
[0003] By the way, when this heat exchanger was used as a heat exchanger for exterior units and the OAT fell at 0 degree C or less at the time of heating operation of winter, there was a problem that produced frost on a fin front face, airflow fell to it by the increment in a draft resistance, and heating capacity fell to it. And as one effective means for solving the problem resulting from the frost to this fin, the technique which eccentricity of the heat exchanger tube is carried out to a trailing-edge side rather than the center position of the fin cross direction, it is arranged to a fin, and the fin efficiency by the side of fin first transition is reduced intentionally, and controls frost is known so that it may be indicated by JP,61-161569,U. In addition, since a fin first transition part is a part which frost tends to produce while high efficiency of heat transfer is acquired according to the first transition effectiveness, a heat exchanger tube is arranged off center to a fin trailing-edge side in this way for reducing the fin efficiency of this first transition part by keeping away a heat exchanger tube from fin first transition.
[0004]
[Problem(s) to be Solved by the Invention] However, when it is made to reduce the fin efficiency of the first transition part of a fin from a viewpoint of frost control in this way, in the condition that frost has not arisen, the heat exchange capacity of a heat exchanger will decline a fallen part of the fin efficiency of the above-mentioned fin first transition part. Moreover, as a result of reducing the fin efficiency of a fin first transition part, the defrosting effectiveness fell at the time of defrosting when frost arises into this first transition part, and there was also a problem that defrosting operation time became long.
[0005] Then, the invention in this application is made for the purpose of offering the heat exchanger which enabled it to aim at the reservation of airflow and the improvement in defrosting effectiveness in the condition of having produced frost while reconciling control of frost of a fin first transition part, and reservation of the high fin efficiency in the condition of not frosting.
[0006]

[Means for Solving the Problem] In the invention in this application, the following configurations are adopted as a concrete means for solving this technical problem.
[0007] Fin 2A is attached in the direction which intersects perpendicularly with receiving a heat exchanger tube 3 in invention of the 1st of this application. In the heat exchanger it was made to circulate a cooling wind towards the trailing-edge 2Ab side located in the other end from the first transition 2Aa side located in the end of the cross direction of this fin 2A While carrying out eccentricity of the above-mentioned heat exchanger tube 3 to the above-mentioned trailing-edge 2Ab approach and arranging it rather than the center position in the cross direction of the above-mentioned fin 2A The 1st flat part 11 which consists of flat sides of the predetermined width of face prolonged crosswise [this / fin] corresponding to the straight line L prolonged crosswise [fin] through the core of this heat exchanger tube 3 to the above-mentioned first transition 2Aa approach part rather than the above-mentioned heat exchanger tube 3 in the above-mentioned fin 2A, It is characterized by the thing of the plurality which is located in the both sides of the fin die-length direction to this 1st flat part 11, respectively, and is prolonged in this fin die-length direction which louvering was carried out and was established for 4, 4, and ..
[0008] In the heat exchanger which starts the 1st above-mentioned invention in invention of the 2nd of this application The above-mentioned louvering is carried out. in the fin die-length direction, while adjoins and it can set to a heat exchanger tube 3 side -- the above-mentioned louvering is carried out and it can set to the heat exchanger tube 3 side of fin die-length direction edge 4a of 4, and another side -- between fin die-length direction edge 4a of 4 While forming the 2nd flat part 12 which consists of flat sides which extend crosswise [fin], it is characterized by setting up the dimension W in the fin die-length direction of this 2nd flat part 12 so that it may be set to "W>=D/2", when the outer diameter of the above-mentioned heat exchanger tube 3 is set to D.
[0009]
[Effect of the Invention] In the invention in this application, the following effectiveness is acquired by considering as this configuration.
[0010] ** The heat exchanger concerning invention of the 1st of this application While carrying out eccentricity of the above-mentioned heat exchanger tube 3 to the above-mentioned trailing-edge 2Ab approach and arranging it rather than the center position in the cross direction of the above-mentioned fin 2A The 1st flat part 11 which consists of flat sides of the predetermined width of face prolonged crosswise [this / fin] corresponding to the straight line L prolonged crosswise [fin] through the core of this heat exchanger tube 3 to the above-mentioned first transition 2Aa approach part rather than the above-mentioned heat exchanger tube 3 in the above-mentioned fin 2A, The plurality which is located in the both sides of the fin die-length direction to this 1st flat part 11, respectively, and is prolonged in this fin die-length direction carried out louvering, and 4, 4, and .. are prepared.
[0011] Therefore, by the above-mentioned heat exchanger tube 3 being arranged off center by trailing-edge 2Ab approach rather than the center of the fin cross direction of the above-mentioned fin 2A, as compared with the case where this heat exchanger tube 3 is arranged in the center section of the fin cross direction, the fin efficiency of this trailing-edge 2Ab part will be low, and the frost to this first transition 2Aa part will be controlled so much.
[0012] The heat transfer engine performance high as the whole fin 2A will be secured

because decline in the fin efficiency of the first transition 2Aa part by having arranged the above-mentioned heat exchanger tube 3 off center to the trailing-edge 2Ab approach of the above-mentioned fin 2A carries out the above-mentioned louvering to a first transition 2Aa approach part, prepares 4, 4, and .. and, on the other hand, raises a surface heat transfer rate rather than the above-mentioned heat exchanger tube 3, and the heat exchange capacity in the condition of not frosting will be maintained good.

[0013] furthermore, the thing which louvering was carried out and was established [above-mentioned] for 4, 4, and .. the time of heating operation -- this louvering -- carrying out -- 4, 4, and .. a part -- frost -- being generated -- being easy -- removal of this frost that carried out louvering and that was produced in 4, 4, and .. is needed. In this case, although this louvering is carried out, this louvering of the defrosting of 4, 4, and .. is carried out from the above-mentioned heat exchanger tube 3 side and it is performed by heat transfer to 4, 4, and .. In this case, since it is arranged so that this louvering may be carried out and 4, 4, and .. may be located in those both sides to the 1st flat part 11 of the above The path length of the above-mentioned heat transfer path which carries out louvering and results in 4, 4, and .. through this 1st flat part 11 For example, as compared with the case where this 1st flat part 11 is not formed, but carry out the above-mentioned louvering from the above-mentioned heat exchanger tube 3 like [when louvering is carried out and 4, 4, and .. are continuing / above-mentioned / in the fin die-length direction], and heat transfer is bypassed and carried out to the 4, 4, and heel side of .., it becomes short as much as possible. Therefore, above-mentioned each louvering is carried out from the above-mentioned heat exchanger tube 3, heat is efficiently transmitted by 4, 4, and .., each louvering is carried out, frost of 4, 4, and .. is removed [above-mentioned] more quickly, and compaction of defrosting time amount can be aimed at so much.

[0014] ** According to the heat exchanger concerning invention of the 2nd of this application, in addition to the effectiveness of a publication, the following characteristic effectiveness is done so by the above-mentioned **. The above-mentioned louvering is carried out. that is, in this invention, in the fin die-length direction, while adjoins and it can set to a heat exchanger tube 3 side -- the above-mentioned louvering is carried out and it can set to the heat exchanger tube 3 side of fin die-length direction edge 4a of 4, and another side -- between fin die-length direction edge 4a of 4 While forming the 2nd flat part 12 which consists of flat sides which extend crosswise [fin], the dimension W in the fin die-length direction of this 2nd flat part 12 is set up so that it may be set to "W>=D/2", when the outer diameter of the above-mentioned heat exchanger tube 3 is set to D.

[0015] therefore, the above-mentioned louvering of the above-mentioned fin 2A -- carrying out -- 4, 4, and .., although the path area of the cooling style by the frost will decrease as for a theory top and a draft resistance will become large, if frost is produced into a part The above-mentioned louvering is carried out in this invention. 4, 4, and .. rather than the above-mentioned heat exchanger tube 3 A first transition 2Aa approach part, Namely, it is prepared in the part with few [from the first] amounts of ventilation, and adds to there being little reduction of this amount of ventilation that carries out louvering and that is depended also for producing frost in 4, 4, and .. A heat exchanger tube 3 side carries out louvering, and the heat exchanger tube 3 side of 4, 4, .., another side carries out louvering. While adjoining in the fin die-length direction Between 4, 4, and .., The amount of ventilation in this part is most secured in the part with many [a

draft resistance / a draft resistance is low and] amounts of ventilation by the 2nd small flat part 12 of the above of the draft resistance set up so that the width method W might be set to "W>=D/2", when the outer diameter of the above-mentioned heat exchanger tube 3 was set to D being formed. Namely, as these synergistic effects The above-mentioned louvering is carried out and sufficient amount of ventilation is secured irrespective of the frost to 4, 4, and ..

[0016]

[Embodiment of the Invention] Hereafter, the heat exchanger concerning the invention in this application is concretely explained based on a suitable operation gestalt. The heat exchanger 1 concerning the operation gestalt of the invention in this application is shown in drawing 1 . This heat exchanger 1 is equipped with two or more heat exchanger tubes 3 and 3 and .. which penetrated the fin 2 and this fin 2 which consist of flat thin strips in that direction of board thickness, and have been arranged at about 2 train, and is constituted. In addition, although considered as the gestalt which unified fin 2A corresponding to each heat exchanger tubes 3 and 3 of the single-tier eye located in that first transition 2a approach in the above-mentioned fin 2, and .., and each heat exchanger tubes 3 and 3 of eye two trains are located in trailing-edge 2b approach and fin 2B corresponding to .. in the thing of this operation gestalt Substantially, it is distinguished bordering on the chain line L0 of this drawing by fin 2A by the side of first transition 2a, and fin 2B by the side of trailing-edge 2b. And in the thing of this operation gestalt, the invention in this application is applied to the structure by the side of the above-mentioned fin 2A. Therefore, the structure by the side of the above-mentioned fin 2A etc. is mainly explained below.

[0017] the trailing-edge 2Ab approach location was made to carry out eccentricity to the above-mentioned fin 2A side rather than the center of the fin cross direction of this fin 2A, and each above-mentioned heat exchanger tubes 3 and 3 and .. which constitute single-tier **** are arranged (namely, the time of setting spacing of "S1", a heat exchanger tube 3, and trailing-edge 2Ab to "S2" for spacing of a heat exchanger tube 3 and first transition 2Aa -- "S1>S2 -- "). And rather than the above-mentioned heat exchanger tube 3 in the above-mentioned fin 2A, plurality carries out louvering to the 1st flat part 11 which following-**, and 4, 4, and .. are formed in the first transition 2Aa approach part.

[0018] On both sides of the straight line L which comes to start in the shape of [above-mentioned / to which 4, 4, and .. extend in the direction of the fin die-length direction in a part of above-mentioned fin 2A by carrying out louvering] a strip of paper, and is prolonged crosswise [fin] through the core of the above-mentioned heat exchanger tube 3, it is arranged by two trains at both sides, respectively in the fin die-length direction. And louvering is carried out, and louvering is carried out and it is made into the 1st flat part 11 of the above which is located in the one side of the above-mentioned straight line L, which is located in 4, 4, and the other side and which is prolonged to first transition 2Aa and becomes in respect of flat crosswise [fin] from the above-mentioned heat exchanger tube 3 between 4. That is, the above-mentioned louvering is carried out to the both sides whose 1st flat part 11 of the above was pinched in the fin die-length direction, and 4, 4, and .. are arranged, respectively.

[0019] Moreover, louvering is carried out and it corresponds [above-mentioned] to the 4, 4, and heel 4of .. a, and heat exchanger tube 3 side of another side, and it corresponds

to one [this] heat exchanger tube 3 side, and while adjoining in the fin die-length direction is making 4, 4, and heel 4of .. a to carry out the above-mentioned louvering and estrange with the predetermined dimension W in the fin die-length direction in the relation between a heat exchanger tube 3 and the heat exchanger tube 3 of another side. Therefore, the 2nd flat part 12 corresponding to [carry out louvering and] the heat exchanger tube 3 of 4, 4, .., another side corresponding to the heat exchanger tube 3 of one of these which is prolonged between 4, 4, and .. ranging over trailing-edge 2Ab with a predetermined width method from first transition 2Aa of the above-mentioned fin 2A by carrying out louvering and which becomes in respect of flat is formed. In addition, when the outer diameter of the above-mentioned heat exchanger tube 3 is set to "D", the width method W of the 2nd flat part 12 of the above is suitably set up so that it may be set to "W>=D/2."

[0020] It is attached as two or more heat exchanger tubes 3 and 3 and .. which, on the other hand, constitute a 2 train nest of tubes in the above-mentioned fin 2B side located in the trailing-edge 2b approach of the above-mentioned fin 2 are located in the center of abbreviation of the fin cross direction (namely, center of abbreviation of the first transition 2Ba and trailing-edge 2Bb). In addition, each heat exchanger tubes 3 and 3 of a single-tier eye, each heat exchanger tubes 3 and 3 of eye .. and 2 trains, and the arrangement location of .. are relatively set up so that each heat exchanger tubes 3 and 3 of eye two trains and each of .. may be located in each heat exchanger tubes 3 and 3 of a single-tier eye, and each of the location between tubing of .. in this case in the fin cross direction (namely, the circulation direction of A of the cooling style).

[0021] The following characteristic operation effectiveness is done so in the heat exchanger 1 considered as this configuration.

[0022] First, as compared with the case where these each heat exchanger tubes 3 and 3 and the distance from .. to [above-mentioned] first transition 2Aa become long since each above-mentioned heat exchanger tubes 3 and 3 and .. are arranged off center by trailing-edge 2Ab approach rather than the center of the fin cross direction of the above-mentioned fin 2A, for example, each heat exchanger tubes 3 and 3 and .. are arranged in the center section of the fin cross direction, the fin efficiency of this trailing-edge 2Ab part is low. Therefore, the frost to the above-mentioned first transition 2Aa part will be controlled only for the part to which fin efficiency fell.

[0023] If it is the configuration which has, on the other hand, arranged each above-mentioned heat exchanger tubes 3 and 3 and .. off center to the trailing-edge 2Ab side of fin 2A in this way, and lowered the fin efficiency of a first transition 2Aa part while the frost to this first transition 2Aa part can be controlled -- this -- it is as stated above that the problem that the heat exchange capacity as the heat exchanger 1 whole falls to first transition 2Aa a fallen part of the above-mentioned fin efficiency in the condition that frost has not arisen arises. However, in the thing of this operation gestalt, a high surface heat transfer rate is acquired by the first transition 2Aa approach part rather than each above-mentioned heat exchanger tubes 3 and 3 and .., and since louvering was carried out and 4, 4, and .. are prepared [above-mentioned] Decline in the fin efficiency in each above-mentioned heat exchanger tubes 3 and 3 and the first transition 2Aa part of the above-mentioned fin 2A by having arranged .. off center to the trailing-edge 2Ab approach of the above-mentioned fin 2A carries out each louvering, and is filled [above-mentioned] up by 4, 4, and the surface heat transfer rate of .. Also in a configuration of

that the heat transfer engine performance as the whole fin 2A has arranged each heat exchanger tubes 3 and 3 and .. in the center section of the fin cross direction of fin 2A, equivalent extent or the heat transfer engine performance beyond it is secured. Each above-mentioned heat exchanger tubes 3 and 3 and heat exchange capacity high in spite of off-center arrangement of .. will be acquired.

[0024] furthermore, the thing for which louvering was carried out to the first transition 2Aa approach part, and 4, 4, and .. were prepared [above-mentioned] in it as mentioned above rather than the above-mentioned heat exchanger tube 3 of the above-mentioned fin 2A -- the time of heating operation -- this louvering -- carrying out -- 4, 4, and .. a part -- frost -- being generated -- being easy -- the part for defrosting when frost arises -- mainly -- the above-mentioned louvering -- carrying out -- 4, 4, and .. it becomes a part. and defrosting of this frost that carried out louvering and that was produced in 4, 4, and .. this louvering from the above-mentioned heat exchanger tube 3 side -- carrying out -- 4, 4, and .. it is performed by heat transfer to a side. In this case, since it is arranged so that louvering may be carried out and 4, 4, and .. may be located [above-mentioned] in those both sides to the 1st flat part 11 of the above in the thing of this operation gestalt As the continuous-line arrow head H shows to drawing 1 , this 1st flat part 11 carries out the above-mentioned louvering from the above-mentioned heat exchanger tube 3, and serves as 4, 4, and a heat transfer path to .. Louvering is especially located and carried out most to first transition 2Aa approach. The heat transfer path die length by the side of four for example, this 1st flat part 11 is not formed, but like [when louvering is carried out and 4, 4, and .. are continuing / above-mentioned / in the fin die-length direction] The heat from the above-mentioned heat exchanger tube 3 becomes short as much as possible as compared with the thing of a configuration of that heat transfer is carried out through the heat transfer path which carried out louvering and which was bypassed [above-mentioned] to the 4, 4, and heel side of .. as the broken-line arrow head H0 showed to drawing 1 . consequently, at the time of defrosting operation, above-mentioned each louvering is carried out from the above-mentioned heat exchanger tube 3, and heat transmits to 4, 4, and .. efficiently -- having -- this each louvering -- carrying out -- 4, 4, and .. defrosting in a part will be performed more quickly and improvement in the heating property by shortening of defrosting time amount can be expected.

[0025] moreover, the above-mentioned louvering of the above-mentioned fin 2A -- carrying out -- 4, 4, and .., although the path area of the cooling style by the frost will decrease as for a theory top and a draft resistance will become large, if frost is produced into a part There is little reduction of the amount of ventilation which louvering is carried out, and 4, 4, and .. are prepared [above-mentioned] rather than the above-mentioned heat exchanger tube 3 in the first transition 2Aa approach part, i.e., a part with few [from the first] amounts of ventilation, and carries out this louvering in this invention and which is depended also for producing frost in 4, 4, and .., The above-mentioned louvering is carried out. and in the fin die-length direction, while adjoins and it can set to a heat exchanger tube 3 side -- the above-mentioned louvering is carried out and it can set to the heat exchanger tube 3 side of fin die-length direction edge 4a of 4, and another side -- between fin die-length direction edge 4a of 4 The 2nd flat part 12 of the above set up so that the width method W in the fin die-length direction might be set to "W>=D/2", when the outer diameter of the above-mentioned heat exchanger tube 3 was set to D is formed. As the synergistic effect of securing [the draft resistance like the pars intermedia of a

heat exchanger tube with most amounts of ventilation is stopped low, and / sufficient amount of ventilation] **, the above-mentioned louvering will be carried out and amount of ventilation sufficient as the heat exchanger 1 whole will be secured irrespective of the frost to 4, 4, and ..

[0026] In addition, (1) In the above-mentioned operation gestalt, although explained taking the case of the heat exchanger 1 equipped with the heat exchanger tube group of two trains, as for the invention in this application, it is needless to say that it is not limited to the thing of this configuration and a heat exchanger tube group can apply also to the thing of a single tier or the thing more than a triplex row.

[0027] (2) In the above-mentioned operation gestalt, although explained taking the case of what adopted the plate fin as the above-mentioned fin 2, in other operation gestalten, a waffle fin is also employable as this fin 2.

[Translation done.]